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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/690,084	10/20/2003	Daniel A. Koos	NOVLP068/NVLS-000818	4873

22434 7590 08/02/2007  
BEYER WEAVER LLP  
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OAKLAND, CA 94612-0250

EXAMINER
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VINH, LAN

ART UNIT	PAPER NUMBER
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1765

MAIL DATE	DELIVERY MODE
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08/02/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/690,084	<b>Applicant(s)</b> KOOS ET AL.	
	<b>Examiner</b> Lan Vinh	<b>Art Unit</b> 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 June 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6,9-17,24-29,34-60,62-67 and 70-76 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25-27 and 43-56,57-60, 62-67,70-76 is/are allowed.
- 6) ☒ Claim(s) 1-6,9,10,12,14-17,24,28,29 and 34-42 is/are rejected.
- 7) ☒ Claim(s) 11 and 13 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>6/5/2007</u> . | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/5/2007 has been entered.

2. Upon further consideration, the previous allowable claims 1-6, 9-10, 12-17, 24, 28-29, 34-42 are rejected under the new ground of rejection ( 35 U.S.C 103(a)) based on the references of Andricacos et al (US 7,008871) and Kondos et al (US 2005/0074967)

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6, 9-10, 12, 14, 16, 24, 36-37, 38-42 rejected under 35 U.S.C. 103(a)  
as being unpatentable over Andricacos et al (US 7,008871) and view of Kondos et al (US 2005/0074967)

Andricacos discloses a method for fabricating a patterned copper structure. The method comprises the steps of:

receiving the substrate 14 containing the layer of metal 10 covering the dielectric layer 16, the dielectric 16 is exposed (col 3, lines 65-67, fig. 1A and 3D)

wet etching metal from the substrate from a position above or coplanar with an upper level of dielectric to a position below the upper level of exposed dielectric in the layer by spraying the substrate with a wet etching solution, the etching solution contains hydrogen peroxide/oxidizer and an acid (col 4, lines 14-29)

forming the capping layer 18 (cobalt) on the exposed metal portions of the substrate by electroless deposition/PVD, the layer 18 having a thickness of 50-500 angstroms (col 4, lines 59-61; col 6, lines 35-37, 60-65)

Unlike the instant claimed inventions as per claims 1, 9-10, 38, Andricacos fails to specifically disclose that the etching solution oxidizes the metal of the substrate to a metal oxide and removing the metal oxide.

However, Kondo discloses a polishing method comprises the steps of oxidizing the metal of the substrate to a metal oxide by an acidic polishing/etching solution contains an oxidizer (page 13, claim 40), removing the metal oxide by contacting the substrate with an oxide etchant that removes the metal oxide and not the metal (page 4, paragraph 0045)

Thus, one skilled in the art at the time the invention was made would have found that the step of contacting the substrate with a wet etching solution containing oxidizer in Andricacos method would have obviously oxidized the metal of the substrate to a metal

oxide for rendering the oxidized metal water-soluble as taught by Kondo (page 4, paragraph 0045). One skilled in the art at the time the invention was made would also have found it obvious to modify Andricacos method by adding a step of removing the metal oxide as per Kondo to expose the metal surface for further processing

The limitations of claims 2-6, 14, 16, 24, 36-37, 39-42 have been discussed above

4. Claims 15, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al (US 7,008,871) and view of Kondos et al (US 2005/0074967) and further in view of Sasaki (US 5,770,095)

Andricacos as modified by Kondos has been described above. Unlike the instant claimed inventions as per claims 15, 17, Andricacos and Kondos fail to disclose that the etching solution comprises a surfactant, a corrosion inhibitor and a complexing agent. Sasaki discloses a method for forming a film comprises the step of etching using an etching solution comprises etching agents such as acid, peroxide/complexing agents, glycine/surfactant, BTA/corrosion inhibitor (col 4, lines 1-10, col 8, lines 11-25)

Since Andricacos is concerned with a step of etching the metal layer of Cu, one skilled in the art at the time the invention was made would have found it obvious to modify Andricacos and Kondos by using the etching solution comprises a surfactant, a corrosion inhibitor and a complexing agent as per Sasaki because Sasaki discloses that these etching agents are particularly preferably to be used when Cu is employed as the material containing of a metal (col 4, lines 8-12)

5. Claims 28-29, 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al (US 7,008,871) and view of Kondos et al (US 2005/0074967) and further in view of Modak (US 2003/000371)

Andricacos as modified by Kondos has been described above. Unlike the instant claimed inventions as per claims 28-29, 34-35, Andricacos and Kondos fail to disclose the steps of performing a post etching cleaning step of the substrate prior to forming the capping layer and annealing and nitriding the capping layer

Modak discloses a method for forming a semiconductor device comprises the steps of performing a cleaning step to clean the exposed metal portion prior to forming the capping layer (page 2, paragraph 0019), forming a layer on the capping layer by using a process that is performed at an increased temperature/annealing and forming a nitride layer (page 2, paragraph 0021)

One skilled in the art at the time the invention was made would have found it obvious to modify Andricacos and Kondos method by adding a step of performing a post etching cleaning step of the substrate prior to forming the capping layer as per Modak because Modak teaches that a standard cleaning step may followed a polishing/etching step (page 2, paragraph 0019). One skilled in the art at the time the invention was made would also have found it obvious to Andricacos and Kondos method by forming a capping layer by using a process that is performed at an increased temperature/annealing to facilitate filling of the recess as taught by Modak (page 2, paragraph 0019)

***Allowable Subject Matter***

6. Claims 11, 13 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 25-27, 43-60, 62-67, 70-76 allowed.

The reasons for allowance of claims 25, 43, 48, 57, 67 have been discussed in the previous office action

***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1765

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to be 'LV' followed by a stylized flourish.

LV

July 31, 2007